new england's ecosystems

Photo: Steve Delaney

New England's ecosystems are our most valuable natural assets. The richness of our waterways provides opportunities to see remarkable creatures such as bald eagles, striped bass and humpback whales. The northern forest provides habitat for bear, moose and hundreds of species of birds. And, of course, many of our ecosystems are prized for recreational and commercial activities.

But human activities can also significantly alter environmental conditions for better or worse. By taking a look at the condition of our waters, wetlands, air quality and species of interest, we can see the progress we've made in protecting our ecosystems after 30 years and the challenges that remain.

Aquatic Ecosystems

In 1970, many of our rivers, estuaries and harbors were environmental nightmares. Sewage and industrial wastes transformed our waterways into waste dumps with almost no life at all, except perhaps noxious algae blooms. Rivers ran red, blue, or green depending on what dyes were used by mills upstream. Our region's largest river, the Connecticut, was openly referred to as a "landscaped sewer." It was no wonder many New England cities and towns turned their backs on their rivers and harbor fronts, paving them over or walling them from view.

Thanks to federal initiatives such as the Clean Water Act, water quality is much improved. As we see the dramatic results of our investments in pollution controls and sewage treatment, we are rediscovering our rivers and waterfronts. Witness the hugely popular Waterfire events during the summer on Providence's Woonasquatucket River—a river that was once mostly paved over in the city—or canoeists on the Connecticut, no longer a sewer, but home to bald eagles and a small, but rising, stock of wild salmon.

But new pollution challenges lie ahead. In the 1970s, wastewater treatment plants and other "point" sources comprised nearly 50 percent of the identified sources of pollution. Today that figure is less than 20 percent. This explains why we are focusing substantially more attention now on controlling nonpoint pollution sources such as stormwater, failing septic systems and atmospheric deposition (Figure 5).

Eutrophication – The Big Challenge

The biggest problem today for many New England water bodies is not toxic chemicals, but high amounts of phosphorus and nitrogen coming from runoff from over-fertilized lawns and farms, municipal discharges, failing septic systems and atmospheric deposition. These nutrients "overfeed" our waters, accelerating an aging process, known as eutrophication, that normally takes hundreds or thousands of years. Increased levels of nutrients cause high growth of unwanted algae and other aquatic plants. Such overgrowth creates odor and visibility problems, clogs waterways and—as it dies and decomposes—uses up oxygen in the water.

Figure 5. Water Quality Conditions in New England

(Reported As Percent of Assessed Waters)

Supports Designated Uses	Rivers/Streams (mi.)	Lakes/Ponds (acres)	Estuaries (sq.mi.)
Healthy Aquatic Life	96%	89%	97%
Swimming	96%	96%	97%
Fish Consumption	17%*	15%*	17%*
Shellfish Consumption	—	—	79%

*primarily due to statewide mercury advisories

Leading Sources of Pollution	1970s	Municipal Point Sources Industrial Point Sources	▶	1990s	Urban Runoff/Storm Sewers Industrial Point Sources Hydromodification
Leading Types of Pollution	1970s	Pathogens Toxic Chemicals Nutrients/Low Dissolved Oxygen	▶	1990s	Pathogens Low Dissolved Oxygen Nutrients, Metals, Flow Alteration

sources: State CWA§305(b) Water Quality Inventory Reports, ASIWPCA, America's Clean Water, 1983

1983
U.S. vs. A.C. Lawrence Leather Co. of Winchester, NH is one of the first criminal enforcement cases for Clean Water Act and Resource Conservation and Recovery Act violations.

1985
Giant Hole in Earth's Protective Atmospheric Ozone Layer over Antarctica is reported by British scientists.

1984
Amendments to the Resource Conservation and Recovery Act establish the Underground Storage Tank Program and RCRA Corrective Action Program.

1984
Union Carbide Plant in Bhopal, India Releases Methyl Isocyanate killing more than 2000 people.

This leads to low oxygen levels in water and poor habitat that sensitive fish species cannot tolerate. Currently, 31 percent of New England's lakes and ponds are eutrophied.

Phosphorus is the chief cause of eutrophication in most New England lakes and streams while nitrogen is the main contributor in estuaries and coastal areas such as Long Island Sound. In the summer, rivers usually have lower water levels due to less rainfall. This, along with higher summer temperatures and high phosphorus levels, create optimal conditions for algae and nuisance plants to thrive. In the past, to control the discharge of phosphorus from wastewater treatments plants, permits have included limits of one milligram per liter (mg/l). Now limits lower than 1 mg/l are being explored and implemented, where necessary.

EPA, states and tribes are studying many impaired rivers and lakes to determine the amount of nutrients and other pollutants they can handle from point and nonpoint sources before they become unhealthy. The results—known as Total Maximum Daily Loads (TMDLs)—will be used in issuing future permits for wastewater treatment plants and other point-source dischargers, as well as in controlling nonpoint pollution sources.

Managing Stormwater

Urban stormwater continues to be a major source of water pollution in New England. When it rains, oil, grease and other contaminants from roadways and parking lots wash into storm drains which lead directly to rivers and estuaries. Last fall, EPA finalized new regulations requiring cities and construction sites to implement stormwater management plans to minimize pollution to waterways. The regulations will require cities to include such measures as regular street sweeping, ensuring that sewers are not connected to storm drains and educating residents to refrain from dumping oil and other pollutants into storm drains.

Stormwater runoff is a major pollution source in non-urban areas as well. EPA New England and our partners are working closely with agricultural, forestry and local communities to establish Best Management Practices (BMPs) to eliminate nutrients and toxic substances in stormwater runoff.

Restoring Tidal Wetlands

Tidal wetlands have a critical role in New England's environment, providing important habitat and nurseries for birds and fish and improving water quality by filtering out pollutants and sediment. Coastal salt marshes are among the most biologically productive ecosystems in the world, rivaling tropical rainforests in the amount of plant material produced each year.

For many decades, the importance of tidal wetlands was unappreciated or not understood. As a result, thousands of acres of tidal marshes in New England were filled for development, used for garbage disposal, or drained to control mosquito populations. Laws passed in the early1970s halted large-scale loss of tidal marshes by requiring permits for activities in these areas.

Restoring degraded tidal wetlands is another priority in New England. The Connecticut Department of Environmental Protection has won national recognition for helping to restore more than 1,500 acres of tidal wetlands since 1980. Similar efforts are underway in Massachusetts—among those, a state/federal/local partnership to restore 100 acres of salt marsh in Rumney Marsh north of Boston. Massachusetts also has launched an innovative wetlands restoration and banking program involving public agencies and major corporations, such as Gillette.

Losing freshwater wetlands due to activities not reported through permitting programs remains a major concern. According to the U.S. Fish and Wildlife Service, one acre of wetlands can filter toxins, sediment and other pollutants from 7.3 million gallons of water runoff annually. New England states estimate that up to 250 acres of wetlands per state are being lost or altered each year. Efforts to eliminate wetland loss and restore this valuable ecosystem will become increasingly important in the face of continuing population growth and development pressure.

The National Estuary Program

When the National Estuary Program (NEP) was established by Congress in 1985, three of the original four estuaries

December 1985
EPA and U.S. Department of Justice file lawsuit against the State of Massachusetts for illegal discharges of sewage into Boston Harbor.

1986
Emergency Planning and Community Right-to-Know Act requires states to designate emergency planning districts and industries to retain safety data sheets for hazardous substances and report releases of hazardous substances.

1985
EPA's National Estuary Program lists Long Island Sound, Buzzards Bay and Narragansett Bay among first estuaries in country.

1986
Superfund Amendments and Reauthorization Act (SARA) creates mechanisms to speed cleanups.

The Kennebec River: Removing a Dam and Restoring a Fishery

The Edwards Dam on the Kennebec River in Augusta, Maine was breached last summer, allowing water to run freely on a 17-mile stretch of the river for the first time in 162 years. The breaching—and subsequent removal of the dam last fall—was the result of a precedent-setting decision by the Federal Energy Regulatory Commission (FERC) which found that the environmental benefits of removing the dam outweighed the economic benefits of re-licensing the dam. The dam's removal has already resulted in striped bass returning to this area of the river and, eventually, nearly a dozen migratory fish species are expected to return, including Atlantic salmon, shad, alewife and Atlantic and shortnose sturgeon. As fish populations rebound, other wildlife dependent on a healthy fishery will also benefit, including eagles and osprey.

The removal of the dam culminated a decade-long battle that began with the formation of the Kennebec Coalition, which includes groups such as American Rivers, the Atlantic Salmon Federation, the Natural Resources Council of Maine, Trout Unlimited and its Kennebec Valley Chapter. State and federal agencies, including EPA New England, joined the coalition in calling on FERC to take whatever action was necessary, including the dam's removal, to restore historic fish populations to the Kennebec above the dam. Before the dam was built in 1837, the Kennebec River was home to the state's largest population of resident striped bass.

Popular Science magazine recognized the decommissioning of the dam with a 1999 "Best of What's New" award to the Kennebec Coalition and FERC.

targeted for attention were in New England — Long Island Sound, Narragansett Bay and Buzzards Bay. Since then, Casco Bay, Great Bay and Massachusetts Bays have been added. All of New England's estuaries face common environmental concerns such as habitat loss, pollution from nutrients, bacteria and toxic chemicals, and adverse impacts from increasing development.

Each of the NEP estuaries has a management plan for addressing these and other problems unique to their areas. In Narragansett Bay, for example, the NEP kick-started a program to stop the discharge of boater waste (treated and untreated) into the bay, which resulted in designation of all Rhode Island marine waters as a "No-Discharge" area. In Buzzards Bay, the estuary program is tackling the nitrogen pollution problem head-on, resulting in more than 4,000 acres of shellfish beds being reopened. Efforts also are underway for Buzzards Bay to become a No-Discharge area. In Long Island Sound, the NEP has focused major attention on upgrading wastewater treatment plants to reduce nitrogen inputs.

Contaminated Sediments

While we've worked successfully over the past 30 years to reduce pollutant discharges into our waters, bottom sediments in many areas continue to show the ill effects of contamination. Nutrients, PCBs, mercury and other heavy metals are among the substances that bottom sediments store and eventually release into the environment through natural decay, heavy rains or uptake by bottom feeding organisms. EPA's National Sediment Inventory shows that sediment contamination is widespread in many New England watersheds. About 40 percent of southern New England's small coastal estuaries have bottom-dwelling organisms impacted by sediment contamination.

On a positive note, however, federal assessments of contaminant concentrations in New England mussels show that levels of PCBs, copper and the pesticide chlordane are declining. One estuary, Boston Harbor, has seen a 20-fold drop in hydrocarbon levels in mussels and a 10-fold drop in PCB levels in flounder in just the past 10 years.

Air Quality's Influence

New England's terrestrial and aquatic ecosystems are greatly influenced by the air that passes over the region. Pollutants deposited on our land and water can disrupt chemical balances, making trees more susceptible to disease and insect infestation. Acid precipitation can increase the acidity of rivers and lakes, making them uninhabitable for desirable species of fish. Higher acidity also increases the likelihood of high levels of dissolved metals in our waters which, in

April 26, 1986
Chernobyl Nuclear Power Plant Blows Up, causing thousands of deaths, large scale evacuation and significant long-term effects on surrounding environment.

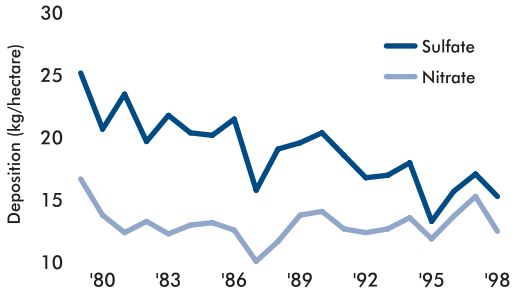
1987
Clean Water Act requires states to upgrade state water quality standards and focus attention on nonpoint source pollution.

1986
Safe Drinking Water Act Amended to promote protection through Well Head Protection Program.

1986
Asbestos Hazard Emergency Response Act (AHERA) to protect school children and employees from exposure to asbestos in school buildings.

1987
Montreal Protocol, signed by U.S. and 23 other nations, pushes for phase out of production of CFCs.

Figure 6. Atmospheric Deposition in New England
1979 - 1998



source: EPA AIRS

turn, can enter the food web of fish, wildlife and people. "Greenhouse" gases and particulate matter in the atmosphere also play a role in long term changes in New England's climate.

Acid rain first came to light as a problem in the late 1970s and is still a major concern for New England. The primary sources of acid rain are sulfur dioxide and nitrogen oxide from coal-fired power plants and other combustion sources, which precipitate as sulfate and nitrate (Figure 6). Reduced sulfur dioxide emissions have resulted in lower levels of acidity in New England rainfall and some recovery of fresh water lakes. Still, decades of acid rain have diminished our soil's ability to neutralize acid, particularly in northern New England. We'll need further reductions in acid rain for significant recovery of lakes and forests.

Many scientists also believe that atmospheric deposition is a primary source of mercury in New England waters. The impact of mercury deposition on our fish and wildlife populations is not yet known. Mercury concentrations in fish tissue prompted five of the six New England states to issue statewide fish consumption advisories, limiting fish consumption for children and pregnant or nursing women. EPA, states, tribes, the Eastern Canadian Provinces and other partners are collaborating in studies and regulatory efforts to reduce mercury transport into our waters and ecosystems.

A Clear View

One of EPA's air pollution goals is to preserve the air quality—in particular, visibility—in our national parks. Without pollution, the natural visual range in the eastern United States is 90 miles. But over the years, air pollution has reduced that range to between 14 and 24 miles. Last spring, EPA announced a program to tackle the haze problem, with a goal of restoring clear skies to 156 national parks and wilderness areas across the country, including the Presidential Range in New Hampshire, Acadia National Park in Maine and the Lye Brook Wilderness Area in Vermont.

Birds & the Environment

Birds are excellent environmental indicators, providing us with a long-term perspective about the health of our ecosystems. With the increase in development in New England, birds that are well adapted to living with humans, such as grackles and starlings, seem to be stable in their abundance. However, birds requiring meadows, shrubland and other grassy open areas are dropping in numbers—among those, bobolinks and meadowlarks. The dramatic reforestation of New England's landscape, after the nearly complete deforestation by agriculture and timber production in the 19th and early 20th centuries, is bringing back a large number of woodland birds such as owls and woodpeckers (Figure 7).

Neotropical migratory birds such as warblers, cuckoos, vireos and hawks are under severe stress, both in New England and other North American breeding grounds and in their Latin American wintering grounds. Many neotropical migrant species, including warblers and flycatchers, have declined dramatically over the last two decades. Twenty-two species that breed in New England and then fly to Central and South America for the winter have suffered population drops due to fragmentation and loss of forest and grassland habitat, pesticide poisoning, predation, adverse land use practices and habitat changes along migratory routes.

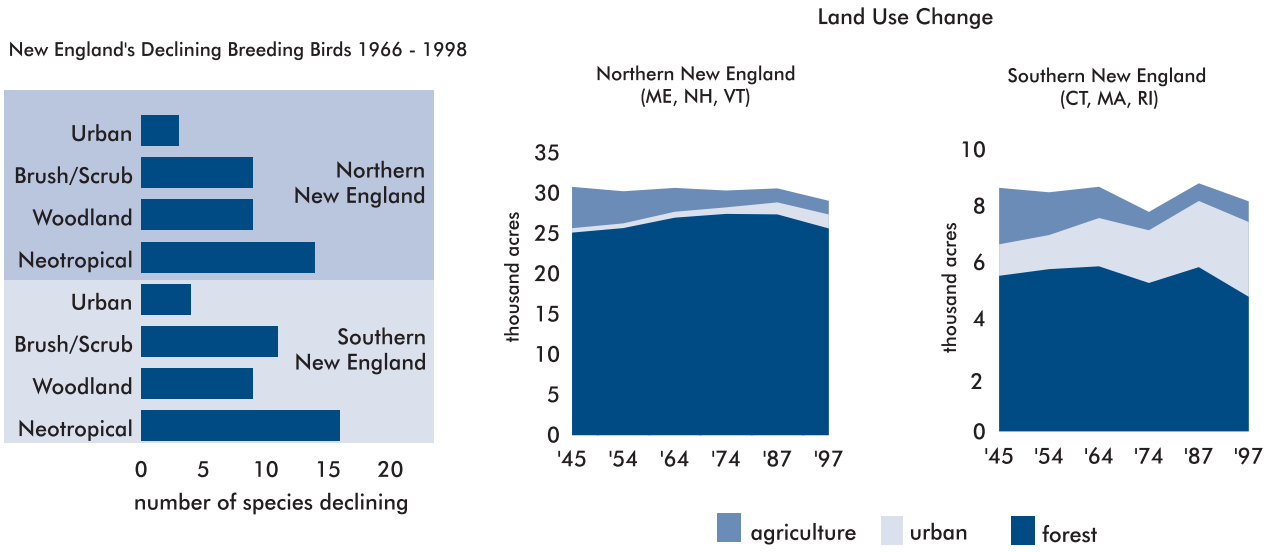
September 1988
EPA & U.S. Surgeon General Urge Homeowners to Test for Radon

1988
100th Emergency Removal Action completed in New England.

May 1988
First National Volunteer Monitoring Conference held at University of Rhode Island. Today, there are more than 20,000 volunteers monitoring New England's waters.

March 24, 1989
Exxon Valdez Spills almost 11 million gallons of crude oil into Alaska's Prince William Sound.

Figure 7. Birds as Indicators of Land Use Change

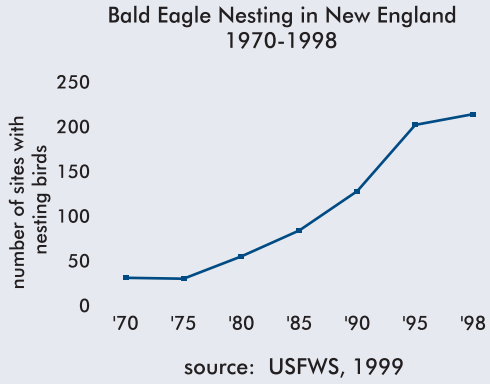


sources: USGS-BRD, Pawtuxet Wildlife Research Station, Breeding Bird Survey, ERS - USDA Major Land Use Database

(Based on over 31.5 mil. acres in Northern New England and 8.8 mil. acres in Southern New England. The difference between total acreage and the sum of these 3 uses is other types of land use.)

Bald Eagle: A Cautious Success Story

When Europeans first arrived in North America, there were approximately 100,000 bald eagles living in what was to become the lower 48 states. By 1967, the population had plummeted to less than 500 breeding pairs. This was due to habitat loss and the effects of the pesticide DDT in the fish that eagles were eating, which caused eggshell thinning. In 1972, DDT was banned and habitat conservation efforts were launched. Bald eagle populations have since rebounded to a current level of 5,748 breeding pairs and continue to improve in the lower 48 states. In New England, there are currently 215 known nesting sites. Although proposed for removal from the federal Endangered Species List, bald eagles remain vulnerable to contaminants in the food chain and to habitat loss.



1989
The *World Prodigy* runs aground off Newport, Rhode Island, spilling 420,000 gallons of oil.

1990
National Environmental Education Act makes EPA the lead federal agency for promoting, supporting & encouraging environmental education.

1990's

1989
Toxics Release Inventory is available, allowing public to know the location and nature of toxic chemical releases from specific industrial facilities in communities.

1990
Pollution Prevention Act encourages industry to reduce toxic emissions through cost-effective changes in production.